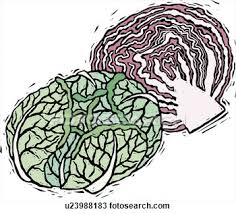
Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Making an Indicator: Cabbage Acid-Base Lab**

Acid-base indicators are generally large organic molecules that react with acids and bases. When they react, the structure of the molecule changes and so does the color. Red cabbage contains two principal types of plant dyes, *anthocyanin* and *flavonol.* The anthocyanin pigments are red in strongly acidic solution, blue in neutral and weakly basic solutions, and colorless in strongly basic solutions. Weakly acidic solutions contain some of the red form and some of the blue form and thus appear purple. Flavonol pigments are colorless in acidic and neutral solutions and yellow in basic solutions. Weakly basic solutions thus contain both blue (anthocyanin) and yellow (flavonol) dyes and appear to be green.

The pH corresponding to various colors will vary slightly with concentration, solvent, age and variety of cabbage, etc. Most flowers and fruits contain anthocyanin.

[](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&frm=1&source=images&cd=&cad=rja&docid=ymMlso9tFyV2mM&tbnid=3x4XicscQCJCqM:&ved=0CAUQjRw&url=http%3A%2F%2Fwww.fotosearch.com%2FUNN417%2Fu23988183%2F&ei=1QvUUpKXAumnsQS_o4GgDA&bvm=bv.59026428,d.eW0&psig=AFQjCNEMuoCn0EyO1CFlMNdhAD06NVq7NA&ust=1389714724011412)

**Part 1: Making your indicator**

1. Put 150-175 mL of water in a 250mL beaker
2. Put beaker on hot plate, boil water
3. While water is boiling, rip up 2 red cabbage leaves into SMALL pieces (2 leaves per beaker).
4. Once water has come to a full boil, put cabbage pieces into beaker, and TURN OFF hot plate
5. Let steep for 5-10 minutes, stirring occasionally with a stirring rod. Solution should turn a deep purple color
6. Pour cabbage mixture through funnel (to catch the cabbage chunks) into a flask.
7. Label your flask with your initials – this is your indicator to use tomorrow!
8. Discard all pieces of cabbage. Rinse empty beakers and flasks. Make sure your hot plate is OFF.

Pre-lab Questions:

1. Why did you have to rip up the cabbage into small pieces first? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What are the two pigments we isolated from the cabbage leaves?
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What color do you predict your indicator will change in the presence of the following:
   1. Acids: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Bases: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Neutral :\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Part 2: Testing your indicator:**

1. Fill a well plate with the following solutions in the following order. Each well should be about ½ full.
2. Test each solution with universal pH paper and record the pH value in the second column.

|  |  |  |  |
| --- | --- | --- | --- |
| Solution | pH (paper) | Color (describe) | Color (draw) |
| HCl |  |  |  |
| Lemon Juice |  |  |  |
| Vinegar |  |  |  |
| 7-up |  |  |  |
| Distilled water |  |  |  |
| Soap |  |  |  |
| Ammonia |  |  |  |

1. Test each well with your indicator – put about ½ as much indicator in as you did solution. Record DESCRIPTIVE details of what color it turns, then try your best to find a matching hue in the colored pencil bin to fill in the 4th column.
2. Once you’ve colored your pH scale in above, ask Ms. F. for unknown samples #1-3. Determine the possible pH value of each unknown by comparing to your scale.

|  |  |  |
| --- | --- | --- |
| Solution # | Color | Most likely pH (or range) |
|  |  |  |
|  |  |  |
|  |  |  |

**Post-lab questions:**

1. Is red cabbage indicator more useful than an indicator such as blue litmus or red litmus? Explain why or why not. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Is a solution which turns red cabbage indicator green *acidic* or is it *basic?* Is a solution which turns red cabbage indicator violet *acidic* or is it *basic? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*